

# 25G PON: The Future of Broadband

As the broadband industry looks to transform fiber to the home to fiber to everything, the advent of 25G has the potential to play a key role in connecting consumers, enterprises and cities and accelerating 5G.

By Ana Pesovic / *Nokia*

**N**okia's recent announcement of the commercial availability of the industry's first 25G PON solution was met with a very favorable reaction. But a regular question we're getting is about the need for 25G PON, given that many broadband operators have yet to implement 10G next-generation PON technologies. The evolution of PON is not just about faster speeds – it's about new opportunities and how fiber can be used in different ways to capitalize on these opportunities.

Until now, PON has been used mainly to deliver residential services, and, to some extent, services to businesses and mobile macro cells. The ambition is to transform fiber to the home (FTTH) to fiber to everything (FTE). In fact, fiber access has the potential to play a key role in connecting consumers, enterprises and cities and accelerating 5G. It is a single infrastructure that will underpin the entire telecoms industry.

To deliver on that promise, fiber networks must become faster, smarter and more cost-efficient. This is a top priority for any successful access technology, and 25G PON is the technology that fulfils all these requirements.

## HITTING THE RIGHT SPOT

25G PON is the next best step because it delivers the right capacity at the right cost. Until now, generations of PON technologies have been dependent on the preexistence of

long-haul and metro optical technologies. As those technologies have matured, the costs have come down, and have reached a point that make the technologies viable for the mass broadband market. This trickle-down effect has been successful but it needs time to really take hold.

However, 25G PON has come about relatively quickly by instead leveraging 100G Ethernet technology (with 25 Gbps channels) used for intra-data center connectivity. The demand for data center capacity is booming. It has driven volumes and reduced prices on 25G components to the point where the mature ecosystem already enables a cost-effective 25G PON solution.

There is strong cross-industry support for 25G PON, as evidenced by the creation of the 25GS-PON MSA Group, communications industry operators, system vendors and component vendors that have come together to define and develop 25G PON technology. The members' view is that there are extremely compelling near-term use cases that require enhanced broadband capacity, and their goal is to create an ecosystem and a standard that will ensure common functionality and interoperability.

## DEPLOYMENT SCENARIOS

The first urgent use case for 25G PON is enterprise services. The gold standard for businesses is now 10 Gbps, which is currently

delivered by costly, dedicated point-to-point (P2P) fiber. Even XGS-PON cannot deliver a full 10G because of various overheads restricting the available bandwidth to 8–9 Gbps. 25G PON can deliver data transfer rates of 20 Gbps. This means it can deliver a premium business service, with no compromise on 10 Gbps peak rates, and still have plenty of capacity to spare.

Deploying 25G in overlay of the existing PON with an additional wavelength means that bandwidth demands of enterprise customers can be met on a network originally built for residential services. A single converged network is cheaper to deploy, operate and maintain than two separate networks (for example, PON for residential and P2P for enterprise). Separation of residential and enterprise service on a PON can still be done through dedicated wavelength or network slicing.

As with many things in telecom these days, 5G is also a driving factor for 25G PON. Increasing the capacity and coverage in 5G technology results in many more radio cells than with 3G or 4G LTE, and these cells need fiber connectivity to carry mobile traffic deeper in the network. The densification of 5G small cells will be particularly prominent in urban areas where demand will be greatest.

Drawing a dedicated fiber link to every 5G small cell would be prohibitively expensive, and microwave backhaul difficult to achieve, in an urban environment with poor line of sight. This isn't the case with an FTTH network because of its shared medium and because FTTH networks are already in place in dense, urban areas. If the capacity is there, using FTTH for mobile backhaul becomes a no-brainer. However, GPON is insufficient for 5G, and even XGS-PON will struggle where there is a high capacity and high density of 5G small cells on a PON.

25G PON excels in these situations, with not only the capacity to support 5G throughput but also the low latency required to use a PON for fronthaul and midhaul mobile transport as well. Using

an existing FTTH network for mobile transport means mobile operators can connect 5G small cell locations more quickly, eliminating the need for a dedicated transport network and cutting the total cost of ownership in half.

The last compelling use case is a combination of all the above: convergence. The 25G PON specification developed by the 25GS-PON MSA Group ensures that it can coexist with both GPON and XGS-PON and can be implemented in an existing FTTH network without disrupting services. The capacity of 25G PON makes it possible for an operator to support premium business services, gigabit residential broadband, and 5G mobile transport – all on the same fiber. Greater capacity also creates new revenue opportunities through network sharing. Using software-defined network slicing, a 25G PON network owner can carve out virtual gigabit PON networks for wholesaling, converging even more revenue-generating services over the same infrastructure and enhancing the business case.

### LOOKING BEYOND 25G

PON evolution never stops. The industry is preparing for 25G PON, but the work on evolution beyond this started years ago. Nokia is one of the technology companies leading the way in the standardization of 50G PON, but it is safe to say it is 8–10 years away from commercial deployment.

25G PON leverages existing technologies and a mature ecosystem, but 50G PON is a quantum leap that requires a new generation of lasers, optical amplifiers and processing power, all of which are in their infancy. Waiting for 50G PON is not an option because 10 years is a long time in broadband. Just think back to the broadband service you had in 2010! Operators need to increase capacity way before then. 25G PON provides the next step that operators need. ❖

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